

CLAIMS

1. A balloon catheter comprising:

5 a inflatable balloon comprising a balloon wall defining an interior volume, the balloon further comprising a distal end, a proximal end, and a central portion disposed therebetween;

10 a catheter comprising an elongated shaft extending along an axis between a distal end portion and a proximal end portion, the proximal end portion comprising a connector configured to engage an inflation device, the distal end portion fixedly connected to the proximal end of the balloon, and a lumen extending through the shaft and in fluid communication with the interior volume of the balloon; and

a stiffening member extending distally from the distal end portion of the catheter and through the interior volume of the balloon, the stiffening member being non-fixedly connected to the distal end of the balloon,

15 wherein movement of the distal end of the balloon relative to the proximal end of the balloon is not restrained by the catheter,

wherein axial movement of the distal end of the balloon relative to the proximal end of the balloon in a direction generally parallel to the axis of the shaft is not restrained by the stiffening member, and

20 wherein transverse movement of the distal end of the balloon relative to the proximal end of the balloon in a direction generally perpendicular to the axis of the shaft is restrained by the stiffening member.

25 2. The balloon catheter according to claim 1 wherein the balloon has a deflated axial length when deflated, and an inflated axial length when inflated, the deflated axial length and the inflated axial length each being

defined by the distance between the proximal end and the distal end of the balloon, the deflated axial length being different than the inflated axial length.

3. The balloon catheter according to claim 1 wherein the balloon has a deflated axial length when deflated, and a partially inflated axial length when partially inflated, the deflated axial length and the partially inflated axial length each being defined by the distance between the proximal end and the distal end of the balloon, the deflated axial length being different than the partially inflated axial length.

4. The balloon catheter according to claim 1 wherein the balloon has a partially inflated axial length when partially inflated, and a fully inflated axial length when fully inflated, the partially inflated axial length and the fully inflated axial length each being defined by the distance between the proximal end and the distal end of the balloon, the partially inflated axial length being different than the fully inflated axial length.

5. The balloon catheter according to claim 1 wherein the balloon wall comprises one of a non-elastic material, a non-compliant material, and a semi-rigid material.

6. The balloon catheter according to claim 1 wherein the balloon wall comprises axially oriented creases or pleats to facilitate radial compression of the balloon when deflated.

7. The balloon catheter according to claim 1 wherein the stiffening member comprises a proximal portion extending along and generally parallel to the shaft of the catheter.

5 8. The balloon catheter according to claim 7 wherein the proximal portion of the stiffening member is disposed within the lumen of the shaft of the catheter, and wherein a proximal end of the proximal portion of the stiffening member is fixedly connected to the proximal end portion of the catheter.

10 9. The balloon catheter according to claim 8 wherein the lumen of the shaft of the catheter has a first cross-sectional area and the stiffening member has a second cross-sectional area, the second cross-sectional area being less than the first cross-sectional area so as to permit an inflation fluid
15 to flow through the lumen between the connector on the proximal end portion of the catheter and the interior volume of the balloon.

20 10. The balloon catheter according to claim 9 wherein the distal end portion of the catheter comprises a distal end that terminates within the interior volume of the balloon, the distal end comprising a port to permit the inflation fluid to flow between the lumen of the catheter and the interior volume of the balloon.

25 11. The balloon catheter according to claim 9 wherein the distal end portion of the catheter comprises a distal end that terminates within the interior volume of the balloon, the distal end being fixedly connected to the stiffening member.

12. The balloon catheter according to claim 9 wherein the distal end portion of the catheter comprises a distal end that terminates within the interior volume of the balloon, the distal end being in sliding engagement with the stiffening member so as to align the stiffening member with the to the axis of the shaft and prevent transverse movement of the stiffening member in a direction generally perpendicular to the axis of the shaft.

13. The balloon catheter according to claim 1 wherein the distal end of the balloon comprises a sleeve, a distal end of the stiffening member being slidably disposed within the sleeve.

14. The balloon catheter according to claim 13 wherein the sleeve comprises a distal terminus that is spaced away from the distal end of the stiffening member so as to permit axial movement of the distal end of the stiffening member relative to the distal terminus of the sleeve.

15. The balloon catheter according to claim 13 wherein the sleeve comprises a cannula disposed therein, the cannula having an interior cross-sectional area that is less than an interior cross-sectional area of the sleeve, the interior cross-sectional area of the cannula configured to slidably engage an exterior surface of the sleeve.

16. The balloon catheter according to claim 15 wherein the distal end of the stiffening member comprises a retaining portion, the retaining portion having an exterior cross-sectional area that is greater than the interior

cross-sectional area of the cannula so as to prevent the distal end of the stiffening member from passing through the cannula.

5 17. The balloon catheter according to claim 16 wherein the retaining portion comprises a rounded bead affixed to the distal end of the stiffening member, the bead having a diameter that is greater than an inside diameter of the cannula.

10 18. The balloon catheter according to claim 13 wherein the distal end of the balloon comprises an end cap affixed thereto, the sleeve being defined by an interior volume of the end cap.

15 19. The balloon catheter according to claim 1 further comprising an inflation device for inflating or deflating said balloon, said inflation device being attached to the connector on the proximal end portion of the catheter.

20 20. The balloon catheter according to claim 19 wherein the connector comprises a female luer fitting, and further wherein the inflation device comprises a syringe having a male luer fitting, the male luer fitting being engaged with the female luer fitting.

21. The balloon catheter according to claim 8 wherein the stiffening member comprises a solid wire having a circular cross-section.

22. The balloon catheter according to claim 8 wherein the stiffening member comprises a lumen configured to accommodate the passage of a wire guide.

5 23. The balloon catheter according to claim 8 wherein the stiffening member has a first physical property at a first location and a second physical property at a second location, the first physical property being different than the second physical property.

10 24. The balloon catheter according to claim 23 wherein the first physical property comprises a first stiffness and the second physical property comprises a second stiffness, the first stiffness being greater than the second stiffness, and the first location being proximal of the second location.

15 25. The balloon catheter according to claim 23 wherein the stiffening member has a tapered cross-section.

26. A balloon catheter comprising:

20 a inflatable balloon comprising a balloon wall defining an interior volume, the balloon further comprising a distal end, a proximal end, and a central portion disposed therebetween;

an outer catheter comprising an elongated shaft extending along an axis between a distal end portion and a proximal end portion, the proximal end portion comprising a connector configured to engage an inflation device,
25 the distal end portion fixedly connected to the proximal end of the balloon, and

a lumen extending through the shaft and in fluid communication with the interior volume of the balloon; and

an inner catheter having a proximal portion and a distal portion, the proximal portion extending through at least a portion of the lumen of the outer catheter, the distal portion extending through the interior volume of the balloon and being fixedly connected to the distal end of the balloon,

wherein axial movement of the distal end of the balloon relative to the proximal end of the balloon in a direction generally parallel to the axis of the shaft is not restrained by the outer catheter or the inner catheter, and

wherein transverse movement of the distal end of the balloon relative to the proximal end of the balloon in a direction generally perpendicular to the axis of the shaft is restrained by the inner member.

27. The balloon catheter according to claim 25 wherein the outer catheter comprises an axial length that changes in response to axial movement of the distal end of the balloon relative to the proximal end of the balloon in a direction generally parallel to the axis of the shaft.

28. The balloon catheter according to claim 25 wherein the outer catheter comprises an axially flexible portion that changes in length in response to axial movement of the distal end of the balloon relative to the proximal end of the balloon in the direction generally parallel to the axis of the shaft.

29. The balloon catheter according to claim 25 wherein the inner catheter has an axial length that changes in response to axial movement of

the distal end of the balloon relative to the proximal end of the balloon in a direction generally parallel to the axis of the shaft.

5 30. The balloon catheter according to claim 25 wherein the inner catheter comprises an axially flexible section that changes in axial length in response to axial movement of the distal end of the balloon relative to the proximal end of the balloon in a direction generally parallel to the axis of the shaft.

10 31. The balloon catheter according to claim 25 wherein the inner catheter comprises a lumen disposed therein configured to accommodate the passage of a wire guide.

15 32. The balloon catheter according to claim 25 wherein the distal end portion of the outer catheter is in sliding engagement with the inner catheter and provides lateral support thereto.